MIRONOW ON THE QUESTION OF ASEPSIS IN LAPAROTOMY.[1]

The clinical observations of the last few years have shown that the employment of antiseptic methods in surgical operations is not infrequently the cause of unpleasant effects, both for the patient as well as for the operators. It has furthermore been observed that good results may be obtained without employing these methods, but by relying solely upon cleanliness. This has, in recent times, induced many surgeons, who have well arranged clinics at their disposal, to substitute asepsis for antisepsis. The question therefore arises, whether it is possible to secure asepsis of the wound without employing disinfecting agents during the operation. In view of the unquestionable advantages of the aseptic method, in which no poisonous substances, such as the disinfecting materials, are introduced into the organism during the operation, a thorough investigation of the practicability of the method is called for. Aside from the work of Prof. Rein,[2] no other comparative researches on the subject are known.

The following observations were made in the gynecologic clinic of Prof. Fritsch in Breslau, and carried out in the bacteriologic laboratory of Prof. Flügge. The observations were conducted under the following conditions:

The same room was used for these laparotomies as was used for the other gynecologic operations. The table, instruments, and other operation-requisites, as brushes, aprons, etc., were especially reserved for the laparotomies and used in no other operations. The instruments and towels which came in contact with the field of operation, were sterilized for one hour immediately before the operation, by means of steam at 100° C. Water was sterilized by boiling for one hour. During the operation the instruments were kept in a two per cent. carbolic solution. Sponges were cleaned in two per cent. carbolic solution and twice in sterilized water. The hands of the operator and assistants were washed first with soap, then for five minutes in 1.1000 sublimat solution, and immediately before and during the operation in sterilized water. The silk ligatures, which had been previously boiled for one hour, were sterilized with the instruments just before the operation by means of steam. The abdomen of each patient was first washed with soap, then shaved, washed with 1.1000 sublimat solution, and finally with sterilized water. During the operation no antiseptic substances were introduced into the abdominal cavity, with the exception of iodoform gauze, which was used, after the method of Mikulicz, to tampon the abdominal cavity. The abdominal wounds were dressed either simply with sterilized gauze and cotton, or covered first with dermatol.

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[1] *Centralblatt für Gynekologie*, 1892, No. 42, Oct. 22.

[2] Aseptik oder Antiseptik bei Laparotomien? Prof. G. Rein, *Wien, Med. Presse*, 1891, No. 8.

This method of operation was followed in aseptic cases, and also in cases in which a septic infection had been previously diagnosed.

The method of investigation was as follows:

For each laparotomy two or three rolls of sterilized gauze in the form of small sponges were prepared and mounted on sponge-holders. These were rolled in a towel, and before the operation sterilized with the instruments. Immediately before the operation these bits of gauze were arranged ready for use. In the course of the laparotomy, the contents of the abdominal cavity were twice investigated: (1) immediately after the opening was made, and (2) at the close of the operation, immediately before suturing the abdominal wound. This was done by wiping the sterilized gauze over the peritoneum of the abdominal and pelvic cavities, the intestines and the tumor. A good sized piece of the gauze was then cut off with a sterilized instrument, and placed in a glass with ten per cent. gelatine and one and a half per cent. agar-agar. In this manner a considerable portion of the abdominal cavity, in every case the entire field of operation, was subjected to this examination for micro-organisms, at the beginning and at the end of the operation. In some cases during the entire operation the atmosphere in the immediate vicinity of the wound was tested by means of Peter's gelatine plates. Pieces of inflammatory adhesions, bits of the peritoneum, the contents of Fallopian tubes, pieces of sponges, etc., were also subjected to bacteriological examination. The observations extend over thirty-one laparotomies performed for various diseased conditions.

Mironow here introduces a table of his researches, in which he gives the name and duration of the operation, complications observed during the progress of the operation, bacterial contents of the abdominal cavity, (1) at the beginning and (2) at the end of the operation, other objects tested during the operation, and the course of the patient's temperature.

The table shows that among the twenty-eight cases in which the abdominal cavity was examined at the close of the operation, micro-organisms in greater or lesser numbers were identified in twenty cases, while eight cases showed no trace of bacteria. Of the twenty-three cases examined immediately after opening the abdomen, no micro-organisms were discovered in twenty-one. From these figures it must be judged that the gauze used in the experiments was sterile, and that the manipulation of the cultures was likewise without fault. Micro-organisms gained access into the abdominal cavity from without, during the progress of the operation. It is seen that, in the aseptic method of performing a laparotomy, the abdominal cavity, as well as the field of operation in general, does not remain aseptic in a bacteriological sense. Another question now arises, as to how much practical, clinical significance can be attributed to these facts. The table shows that notwithstanding the very frequent presence of micro-organisms in the abdominal cavity at the close of the operation, still septic infection was observed in but one of these cases, and that must be regarded as an exception, for the operation was undertaken after a pronounced state of septicæmia had developed. Nevertheless, from a clinical standpoint, we can not regard with indifference the introduction into the abdominal cavity of non-pathogenic micro-organisms, such as the microc. cereus albus or the peculiar oval coccus observed by Mironow in these researches. In eleven of the fifteen cases, in which these micro-organisms were found, a considerable rise of temperature occurred after the operation. The air and the hair and beards of the operator and assistants, which were not sterilized, must be looked to as the sources of the organisms which found access to the peritoneal cavity during the operation; and it is important to observe that in the operations which were quickly completed, which did not last more than fifteen minutes, in which the atmosphere was but for a short time in contact with the peritoneum, the after-course in the majority of cases was entirely without febrile movement.

Among eleven such cases, six had a perfectly normal temperature, three reached 38°–38.4° C. and immediately subsided, and two cases had a temperature of somewhat above 38° for some days. In the three cases in which the atmosphere about the wound was examined, it was found to contain either the same micro-organisms as were found in the abdomen or the same microc. cereus albus, which was so frequently discovered in the abdomen in the other cases.

The first endeavor of the surgeon must be directed to the sterilization of the atmosphere about the field of operation; which up to the present time has not been made practicable. Prof. Rein was unable to effect a complete sterilization of the atmosphere during the operation, notwithstanding that it was passed through a cotton filter, and that the Ssapjeschko apparatus was used for spraying the air of the operating room. It must be assumed, however, that the air of the operating room usually contains no pathogenic bacteria, and that it can therefore be purified to a higher degree.

The question, whether the abdominal cavity contains micro-organisms capable of growing on gelatine and agar, must, on the ground of the above observations, be answered in the negative. Out of the twenty-three cases, in which the abdominal cavity was examined immediately after the opening, in twenty-one cases the cultures with the gauze remained completely sterile; and only two cases showed even three colonies of the peculiar oval coccus, mentioned above. The explanation of this should, perhaps, be looked for in some imperfection of the method at the operating table. Among the twelve cases in which adhesive peritonitis occurred, no micro-organisms were found immediately after opening the peritoneum in eleven. These observations confirm the views of Bumm,[1] and the opinion of surgeons generally, that adhesive peritonitis can be caused without the presence of bacteria, simply through mechanical or chemical irritation. Finally the observations prove that the contents of cysts and adherent Fallopian tubes, even when of a decided purulent character, in the majority of cases contain no living micro-organisms; which explains the fact that their rupture into the abdominal cavity is, as a rule, followed by no untoward results. It is evident that the peritoneum itself, as well as the contents of tumors included by it, notwithstanding the arising of inflammatory symptoms, are entirely aseptic, and the use of antiseptic agents is, therefore, superfluous. These researches have shown that in cases in which the surgeon has to do with tissues which before the operation were not infected—and such is the case in the vast majority of laparotomies—the use of asepsis, as employed in the clinic of Prof. Fritsch, is to be regarded as abundantly adequate for the practical scope of a clinic, since it is not possible to render the field of operation aseptic in a bacteriological sense. The views of Prof. Rein concerning the advantages of asepsis over antisepsis must be concurred in.

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[1] Zur Aetiologie der septischen Peritonitis. Münchener Med. Wochenschrift, 1889, No. 42.

With regard to uterine cases in which septic infection has occurred before the operation, and in which there is the possibility that septic micro-organisms may find their way into the abdominal cavity during the operation, it is useful, after washing out the uterine cavity, to tampon it with iodoform or sublimate gauze. Still further the employment of the Paquelin cautery is to be recommended in place of the knife and scissors for dividing infected tissue. By this means the neighboring tissue is to a certain extent protected from infection. For these septic cases, the future must teach to what degree antiseptic agents can be employed, and the advantages of the antiseptic over the aseptic method still remains an open question.

In a case subjected to Porro's operation, and in which a pronounced septic condition existed before the operation, the same bacteria were found in the peritoneal cavity as had been found in the uterus. They are small rods, and grow so rapidly that in the course of twenty-four hours large white round colonies develop, which on the surface of the gelatine in the section appear as half circles, while the colonies deeper in the gelatine are smaller and have a yellow color. Under a weak magnifying power, they appear as round plaques, with sharp, even borders, dark brown in the middle, and a yellowish border on the periphery. In the stich-culture in gelatine small, white, round colonies, grouped closely to one another are formed; which do not fluidify the substratum, and which later on assume a yellow color. They grow equally well by room-temperature or at 37°C. On agar and potato, they form a dense, yellow coat. They grow well in bouillon. These colonies are composed of small, short bacilli, the ends of which are evenly truncated. In the fresh state, these bacilli are in active motion, and group themselves in pairs united by their extremities. They stain readily with methyl blue, gentiana and other colors. The bacilli cultivated in bouillon appear somewhat larger than those grown on gelatine, agar or potato. Introduced in a very limited quantity—one-half to one drop of emulsion—under the skin of a rabbit, or applied as a pure culture on the skin of a mouse, no local inflammation is excited, but a mild, general, constitutional disturbance is produced. The animal appears weak, and the appetite fails. Rabbits develop a febrile movement reaching 41.3°C, which subsides in one or two days. When a pure culture of these bacilli as an emulsion with a six per cent. salt solution is introduced directly into the blood of a rabbit to the amount of 1 ccm., the animal perishes in from thirteen to sixteen hours. Half of this amount causes death in from eighteen to twenty hours. The autopsy usually shows marked hyperæmia of all the parenchymatous organs, and a heart distended with blood. Abscesses or infarctions appear in the liver and kidneys. The bacillus may be cultivated from the liver, kidney, spleen, blood, etc. The injection from these cultures under the skin of rabbits gives rise to the same symptoms as above described. An emulsion of the culture in six per cent. salt solution, sterilized for two hours by steam, when injected into the ear vein of a rabbit in a dose of 2 ccm., caused no reaction. The same negative result followed the injection of a thick bouillon emulsion, after filtering the emulsion by means of the Chamberland filter; even in doses of one, two and even four ccm.

On the ground of these researches it may be concluded that the bacilli in question are possessed of pathological peculiarities, inasmuch as they multiply in the animal organism, and are capable of causing a septicæmia which is rapidly fatal. In shape and peculiarities they resemble nearest the bacillus described under the name of B. septicus agrigenus,[1] and can be properly called B. septicus hominis. In the case above mentioned this bacillus must be regarded as the only cause which could have given rise to the septicæmia, considering that neither streptococcus nor staphylococcus, the usual causes of septicæmia, were found; and also that before, as well as during the operation, no characteristic septic peritonitis could be discovered. Furthermore the autopsy showed only to a very limited extent any trace of peritonitis, and it can be assumed that this case was not the ordinary form of septicæmia, as the streptococcus is wont to produce. In fact it must be further assumed that aside from the already known forms of septicæmia caused by the streptococcus puerperalis, is still another form caused in puerpera by the above described bacillus—the bacillus septicus hominis.

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[1] Flügge l. c. p. 275.

James P. Warbasse.

CRANIO-CEREBRAL TOPOGRAPHY AND ITS SURGICAL APPLICATION.

The appearance of two separate volumes from the French gives increased interest to this important subject.[1] Both are exceedingly valuable contributions to the topographical knowledge of the skull and brain. As a basis or starting point for the study of the topography of the encephalon, Poirier selects four points: 1st, the middle of the naso-frontal suture or the vertex of the naso-frontal angle (narion of Broca): 2d, the external occipital protuberance (inion of Broca): 3d, the external auditory meatus: 4th, the lambda or point of union of the lambdoidal and sagittal sutures. The first mentioned or that represented by the vertex of the naso-frontal angle can, as a rule, be easily identified. The second if not easily recognized, may be, in even the most difficult, by strongly flexing the head. The tension exerted by the ligamentum nuchæ leads to its recognition or it may be detected by following the superior occipital ridge or line. The third point, the external auditory meatus bears a constant relation to the contents of the cranium as shown by numerous cranio-metric measurements. The

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[1] P. Poirier: Topographie cranio-encéphalique. Trépanation. Paris, Lecrosiner et Babé, 1891. 92 pages.

R. Le Fort. La topographie cranio-cérébrale. Applications chirurgicales. Paris, F. Alcan, 1890, 165 pages.